S.C. Department of Health and Environmental Control

Proposed Plan for Site Remediation

AVX-Myrtle Beach Site/Operable Unit 1
801 17th Avenue South, Myrtle Beach, South Carolina

April 2021

Announcement of Proposed Plan

The South Carolina Department of Health and Environmental Control (DHEC or the Department) has completed an evaluation of cleanup alternatives to address soil and groundwater contamination for Operable Unit 1 (OU-1) at the AVX-Myrtle Beach Site (the Site). Operable Unit 1 includes the footprint of the former AVX facility located at 801 17th Avenue South, Myrtle Beach, South Carolina. Operable Unit 2 (off property groundwater and surface water contamination) was addressed in a previous study and Proposed Plan. This Proposed Plan identifies DHEC's Preferred Alternative for cleaning up the contaminated area and provides the reasoning for this preference. In addition, this Proposed Plan includes summaries of the other cleanup alternatives evaluated. These alternatives were identified based on information gathered during environmental investigations conducted by AVX pursuant to Consent Order 96-43-HW, dated December 1996, between AVX and the Department.

The Department is presenting this Proposed Plan to inform the public of our activities, gain public input, and fulfill the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the National Oil and Hazardous Substances Pollution Contingency Plan (National Contingency Plan or NCP). This Proposed Plan summarizes information that can be found in greater detail in the Feasibility Study for Operable Unit 1 (FS) dated April 2019 and other documents contained in the Administrative Record file. The Department encourages the public to review these documents to gain an understanding of the Site and the activities that have been completed.

The Department will select a final cleanup remedy after reviewing and considering comments submitted during the 30-day public comment period. The Department may modify the Preferred Alternative or select another response action presented in this Proposed Plan based on new information or public comments.

DHEC's Preferred Cleanup Summary

Alternative 2: Excavation and Enhanced Reductive Dechlorination

DHEC's preferred remedial option includes:

- Excavation and off-site disposal of source area soils.
- Injection of a carbon substrate into the ground to stimulate the breakdown of contaminants in groundwater by a natural process.
- Groundwater monitoring
- Deed notifications/restrictive covenants on the OU-1 Site property.

MARK YOUR CALENDAR

VIRTUAL PUBLIC MEETING:

When: April 15, 2021

Where: Microsoft TEAMS
Columbia, SC
Time: 6:30 PM

DHEC will hold a meeting to explain the Proposed Plan and all alternatives presented in the Feasibility Study. After the Proposed Plan presentation, DHEC will respond to your questions. Oral and written comments will be accepted at the meeting.

PUBLIC COMMENT PERIOD:

April 15, 2021 through May 15, 2021

DHEC will accept written comments on the Proposed Plan during the public comment period. Please submit your written comments to:

Carol Crooks, Project Manager
SC DHEC Bureau of Land & Waste Management
2600 Bull Street
Columbia, SC29201
Crookscl@dhec.sc.gov

FOR MORE INFORMATION:

Call: Carol Crooks, Project Manager, 803-898-0810

See: DHEC's website at:
http://www.dhec.sc.gov/environment/lwm/publicnotice.htm

View: The Administrative Record at the following locations:

Horry County Memorial Library – Socastee Branch
141 SC Hwy 707-Connector
Myrtle Beach, South Carolina

DHEC Freedom of Information Office
2600 Bull Street, Columbia, SC
(803) 898-3817
Monday - Friday: 8:30 am - 5:00 pm

Site Background

The former AVX Corporation Myrtle Beach Facility or Site is located at 801 17th Avenue South, Myrtle Beach, South Carolina (Figure 1). This property is located within an area of undeveloped, residential, and commercial properties in the City of Myrtle Beach. Aerovox Corporation, the predecessor to AVX, began operations at the Facility in 1953. Chlorinated volatile organic compounds (VOC's) were used at this location in the manufacturing of ceramic capacitors until 1993.In 1981, AVX discovered that shallow groundwater beneath the Facility was impacted by VOC's. AVX conducted assessment and some remediation of contaminated soil and groundwater without the Department's knowledge from 1981 until 1995.

In June 1995, AVX notified the Department of the existence of soil and groundwater contamination at the Facility. In 1996, the Department issued a consent order and required AVX to submit a work plan for an investigation and remediation of soil and groundwater. Beginning in 1997, a number of soil and groundwater samples were collected on the plant site in the process of conducting a Remedial Investigation (RI) under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA). The samples collected indicated contamination of groundwater beneath the site with VOC's (primarily trichloroethene). Additionally, the consent order required AVX to update and continue to operate a groundwater treatment system installed by AVX prior to the Consent Order.

In August 2006, the Department received groundwater data from a property owner near the AVX facility indicating the presence of VOC contamination similar to the contaminants found beneath the AVX property. Due to this new data, the Department requested AVX submit a work plan to further investigate potential groundwater contamination beyond the AVX facility's existing monitoring wells. During the off-site investigation, AVX installed a number of groundwater monitoring points to define the bounds of the off-site groundwater contamination and collected surface water and soil gas samples. In 2010, the Site was divided into Operable Unit 1 (OU-1; the facility property) and Operable Unit 2 (OU-2; the off-property groundwater contamination – Figure 1). The purpose of creating operable units was to expedite the process of remediation of the off-property groundwater and surface water contamination. Because AVX planned to remove buildings on the facility property (OU-1), it was advantageous to wait for the demolition of some facility structures to provide better access for the assessment of soil and groundwater contamination. Data collected in the study of OU-2 was evaluated in a Feasibility Study (FS) in 2011. A Proposed Plan for OU-2 was also completed in 2011 and the Record of Decision completed in 2012. The remedy for the off-site groundwater contamination has been implemented and is progressing successfully.

Since 2010, a number of buildings have been removed from the facility property (OU-1). Following the removal of each building, sub-slab sampling was conducted to determine impact to newly exposed soils. Additionally, a comprehensive Feasibility Study Investigation was completed in 2016 to fill any data gaps that might have existed prior to the creation of the 2019 FS report for the evaluation of remedial alternatives.

Site Characteristics

Sources

The primary source areas for groundwater contamination on the Site are soils contaminated with VOCs during previous facility operations. The source areas have been identified during the Feasibility Study Investigation.

Groundwater

Groundwater beneath the site has been contaminated with VOCs from soils impacted by previous facility operations. The on-site groundwater contamination is currently captured by two extraction wells pumping groundwater to a treatment system. This extraction system provides capture of the VOC plume and prevents any further migration off-property. The groundwater contamination consists of various VOCs. The primary constituents of concern (COCs) are trichloroethene (TCE), cis-1,2-dichloroethene (cis-1,2-DCE), vinyl chloride (VC), 1,1-dichloroethane (1,1-DCA), 1,1-dichloroethene (1,1-DCE), and trans-1,2-dichloroethene (trans-1,2-DCE).

Previous Remedial Activities

The off-property groundwater contamination (OU-2) has already been addressed by a Record of Decision completed in June 2012. The remedy of injection of a carbon substrate (molasses), to stimulate the breakdown of VOCs in groundwater (referred to as enhanced reductive dechlorination or ERD), has already been implemented. The ERD remedy has been successful in reducing VOC concentrations in groundwater and has recently reached the final stage of routine monitoring.

Summary of Site Risks

The area adjacent to the Site is zoned for industrial, commercial, and residential usage. The affected aquifer is considered a potential underground drinking water source. The primary exposure routes would be contact with onsite soils or contact/ingestion of affected groundwater containing contamination. The facility is fenced so access is limited and public water is available in this area, and seems to be used by all residents.

It is the Department's current judgment that the Preferred Alternative identified in this Proposed Plan, or one of the other active measures considered in the Proposed Plan, is necessary to protect public health or the environment from actual or threatened releases of hazardous substances. Based on information collected during the previous investigations, an FS was conducted to identify, develop, and evaluate cleanup options and remedial alternatives.

Remedial Action Objectives

The remedial action objectives (RAOs) for the development and evaluation of alternatives for this site are:

- Eliminate site-related COCs from soils that may be leaching into groundwater.
- Restore the groundwater aquifer by reducing the concentrations of Contaminants of Concern (COCs) to below Federal Maximum Contaminant Levels (MCLs) for drinking water.
- Prevent ingestion and dermal contact with groundwater containing COCs above MCLs and minimize the potential for COCs to migrate offsite.

Scope and Role of the Action

The proposed action in this plan will be the final cleanup action forOU-1. The RAOs for this proposed action include preventing exposure to contaminated groundwater and preventing the further migration of contaminated groundwater. The proposed response actions will permanently reduce the toxicity, mobility, and volume of contamination at the Site. Previous actions have been conducted to address the OU-2 off property groundwater contamination.

SUMMARY OF REMEDIAL ALTERNATIVES

Based on information collected during previous investigations, *a Feasibility Study for Operable Unit 1* (Arcadis, 2019) was conducted to identify, develop, and evaluate options and remedial alternatives to address the contamination at the Site. This evaluation considered the nature and extent of contamination and associated potential human health risks developed during the remedial investigations and associated studies to determine and evaluate potential remedial alternatives and their overall protection of human health and the environment. Each remedial alternative evaluated by the Department is described briefly below. Note: A final Remedial Design will be developed prior to implementation of any alternative.

Summary of Soil and Groundwater Clean-up Alternatives

Alternative	Description
1: No Action	• No action for source area soil • No action for groundwater • Net present value costs: $0
2: Excavation and Enhanced Reductive Dechlorination	• Physical removal of source area soils containing COCs and off-site disposal • Injection of an organic substrate to stimulate natural degradation of COCs in groundwater in both the source area and downgradient dissolved plume • Net present value costs: Approximately $5,009,611
3: Excavation and Pump and Treat of Groundwater	• Physical removal of source area soils containing COCs and off-site disposal • Use of extraction wells to remove groundwater from the subsurface and treat for COC removal and discharge of treated water • Net present value costs: $2,777,047
4: Excavation and Groundwater Recirculation	• Physical removal of source area soils containing COCs and off-site disposal • Use of extraction wells to remove groundwater from the subsurface and treat for COC removal with reinjection of treated water into the subsurface • Net present value costs: $4,640,170
5:Insitu Thermal Treatment and Enhanced Reductive Dechlorination	• Destruction of COCs in the source area (soils and groundwater) using thermal heating • Treatment of COCs in the downgradient groundwater plume by the use of an organic substrate to stimulate natural degradation • Net present value costs: $13,197,583
6: Insitu Thermal Treatment and Groundwater Recirculation	• Destruction of COCs in the source area using thermal heating • Use of extraction wells in the downgradient groundwater plume to remove groundwater from the subsurface and treat for COC removal with reinjection of treated water into the subsurface • Net present value costs: $13,841,112

DESCRIPTION OF ALTERNATIVES

Alternative 1 - No Action

The No Action alternative is required by the National Contingency Plan to be carried through the screening process, as it serves as a baseline for comparison of the other remedial action alternatives.

The No Action alternative consists of leaving the Site in its current condition. No active remediation or routine monitoring would be implemented under this alternative. No restrictions on groundwater use would be put in place and no protections against further contaminant migration would be provided.

No cost would be associated with this alternative.

Alternative 2 –Excavation and Enhanced Reductive Dechlorination (ERD)

Excavation and off-site disposal of vadose zone soil containing elevated concentrations of COCs would aggressively reduce contaminant mass and toxicity in soil over a short timeframe. The soil excavation would reduce the potential for COCs in soil to leach to groundwater and decrease the overall timeframe to achieve remedial goals.

Groundwater would be treated by the use of injections of an organic substrate to enhance bioremediation. The treatment of groundwater by the use of ERD has been effective in achieving RAOs in groundwater within the Operable Unit 2 area, and similar effectiveness would be expected in OU-1.

This alternative would also include monitored natural attenuation (MNA) once the active portion of the ERD remedy was complete and institutional controls.

The estimated present value cost is $5,009,611 and the expected duration is 5 years of active remediation and 10 years of MNA.

Alternative 3–Excavation and Pump and Treat of Groundwater

As in Alternative 2, vadose zone soil containing elevated concentrations of COCs would be excavated and removed from the site. The removal would aggressively reduce contaminant mass and toxicity in soil over a short timeframe. The soil excavation would reduce the potential for COCs in soil to leach to groundwater and decrease the overall timeframe to achieve remedial goals.

Groundwater would be pumped from the subsurface and treated for the removal of COCs. Extracted groundwater would be treated and discharged pursuant to a National Pollutant Discharge Elimination System (NPDES) permit. Pump and treat is currently used for groundwater control on the OU-1 site. The pump and treat system is very effective at controlling the further migration of groundwater but would take a very long time to reach RAOs.

This alternative would also include long term groundwater monitoring and institutional controls.

The estimated present value cost is $2,777,047 and the expected duration is 30 years of active remediation and performance monitoring.

Alternative 4 –Excavation and Dynamic Groundwater Recirculation

This alternative also includes the excavation of vadose zone soil containing elevated concentrations of COCs. As with Alternative 2 and 3, the removal would aggressively reduce contaminant mass and toxicity in soil over a short timeframe. The soil excavation would reduce the potential for COCs in soil to leach to groundwater and decrease the overall timeframe to achieve remedial goals.

Groundwater would be treated by the use of dynamic groundwater recirculation (DGR). This process would include a combination of a groundwater pump and treatment system along with directed groundwater reinjection wells. The addition of the reinjection of treated groundwater aids in flushing COCs from aquifer materials helping to reduce the time needed to reach RAOs.

This alternative would also include monitored natural attenuation (MNA) once the active portion of the ERD remedy was complete and institutional controls.

The estimated present value cost is $4,640,170 and the expected duration is 20 years active remediation and 10 years of MNA.

Alternative 5- In-Situ Thermal Treatment and Enhanced Reductive Dechlorination (ERD)

In situ thermal remediation would be conducted to remediate the COCs in soil and groundwater in the source area. The in-situ thermal approach would employ a combination of electrical resistance heating (ERH) and steam enhanced extraction (SEE). Thermal treatment would be highly effective at removing COCs in both the soil and groundwater within the source area

ERD would be used to reduce COC concentrations in the downgradient dissolved phase area. Also, as stated before in Alternative 2, ERD has already been proven to be effective in COC reduction within OU-2.

This alternative would also include monitored natural attenuation (MNA) once the active portion of the remedy was complete and institutional controls.

The estimated present value cost is $13,197,583 and the expected duration is 5 years active remediation and 10 years of MNA.

Alternative 6- In-Situ Thermal Treatment and Dynamic Groundwater Recirculation (DGR)

As in Alternative 5, in situ thermal remediation would be used to remediate the COCs in soil and groundwater in the source area. The in-situ thermal approach would employ a combination of electrical resistance heating (ERH) and steam enhanced extraction (SEE). Thermal treatment would be highly effective at removing COCs in both the soil and groundwater within the source area.

Groundwater, in the downgradient dissolved phase area, would be treated by the use of DGR. The use of a DGR system would use the current extraction wells with the addition of another extraction well and multiple injection wells. The injection of treated groundwater would aid in flushing COCs from aquifer materials helping to reduce the time needed to reach RAOs.

This alternative would also include monitored natural attenuation (MNA) once the active portion of the remedy was complete and institutional controls.

The estimated present value cost is $13,841,112 and the expected duration is 20 years of active remediation and 10 years of MNA.

EVALUATION OF ALTERNATIVES

The National Contingency Plan includes specific criteria to evaluate and compare the different remediation alternatives individually and against each other in order to select a remedy. This section of the Proposed Plan profiles the relative performance of each alternative against the criteria, noting how it compares to the other options under consideration. The criteria are:

1. Overall protection of human health and the environment;
2. Compliance with Applicable or Relevant and Appropriate Requirements (ARARs);
3. Long-term effectiveness and permanence;
4. Reduction of toxicity, mobility, or volume through treatment
5. Short-term effectiveness;
6. Implementability;
7. Cost; and
8. Community acceptance

The main objectives for the preferred remedial action are to be protective of human health and the environment and to comply with State and Federal regulations. These two objectives are considered *threshold criteria*. Threshold criteria are requirements each alternative must meet in order to be eligible for selection. For an alternative to be considered as final, these two threshold criteria must be met. The remedial action must be protective of human health and the environment and comply with State and Federal standards.

The following measures are considered *balancing criteria*: long-term effectiveness and permanence; reduction of toxicity, mobility, or volume through treatment; short-term effectiveness; implementability; and cost. These criteria are used to weigh the technical feasibility, strengths and weaknesses, and cost advantages and disadvantages of each alternative.

Community response to the preferred alternative and the other considered alternatives is a *modifying criterion* that will be carefully considered by the Department prior to final remedy selection.

COMPARATIVE ANALYSIS OFALTERNATIVES

A comparative analysis of each alternative was performed. In this type of analysis, the alternatives were evaluated in relation to one another for each of the evaluation criteria. The purpose of the analysis is to identify the relative advantages and disadvantages of each alternative.

Note: Although Alternative 1 (No Action) does not meet the threshold criteria, it is retained for discussion because it provides a baseline for comparing the other alternatives to the criteria outlined above.

1. Overall Protection of Human Health and the Environment

When evaluating alternatives in terms of overall protection of human health and the environment, consideration is given to the manner in which Site-related risks are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.

Source Area Soils: Alternative 1 (no action) offers the least protection of human health and the environment. No active remediation would be conducted and no long-term monitoring to evaluate potential naturally occurring contaminant reduction would occur or institutional controls to limit access. Alternatives 2, 3, 4 (excavation) and Alternatives 5 and 6 (in-situ thermal treatment) would all be protective of human health and the environment. These alternatives would quickly reduce source area soil COC concentrations and meet RAOs.

Groundwater: Alternative 1 (no action), as described above regarding soils, would offer no protection of human health and the environment. All other Alternatives (2, 3, 4, 5, and 6) would be protective of human health and the environment. However, Alternatives 2 and 5 (ERD) would use a technology proven to be effective in OU-2. Alternatives 3, 4, and 6 (all using pump and treatment systems) would also be effective at controlling the migration of contaminated groundwater but would take longer to meet RAOs.

2. Compliance with ARARs (Applicable or Relevant and Appropriate Requirements)

Each of the alternatives is evaluated with respect to the ability to comply with applicable State and Federal environmental statutes and regulations. All requirements that might require consideration are identified and referred to as Applicable or Relevant and Appropriate Requirements (ARARs). ARARs are further broken into the three categories of chemical-specific, location- specific, and action-specific.

Alternative 1 (no action) is not compliant with chemical-specific ARARs for the source area or groundwater. All other alternatives would comply with chemical-specific ARARs. However, Alternatives 2 and 5 would take less time to achieve MCLs.

All appropriate permits for Alternatives 2, 3, 4, 5, and 6 can be obtained during the design of the system.

No location-specific ARARs have been identified for these alternatives.

3. Long-Term Effectiveness and Permanence

This factor considers the ability of an alternative to maintain protection of human health and the environment over time.

Long-term effectiveness and permanence would not be achieved with Alternative 1 (no action). Potential exposure risks associated with contamination would remain, with no control or long-term management.

Alternatives 2, 3, 4, 5, and 6 would provide effective and permanent removal of source area soils. All of these alternatives would also eventually be effective and permanent in the elimination of groundwater contamination, however, Alternatives 2 and 5 should take significantly less time to achieve remedial goals.

4. Reduction of Toxicity, Mobility, or Volume through Treatment

This factor evaluates an alternative's use of treatment to reduce the harmful effects of principal contaminants, their ability to move in the environment, and the amount of contamination present

Natural attenuation mechanisms may result in the reduction of contaminant mobility, toxicity, and volume in groundwater, but Alternative 1 (no action) provides no monitoring to evaluate risk or determine when remedial goals are met. All active alternatives (2-6) would work well to reduce the mass of contamination in soil by excavation or thermal treatment. Alternatives 2 and 5 would reduce mobility, toxicity and volume of COCs in groundwater insitu in a relatively short time. Alternatives 3, 4, and 6 would reduce mobility by groundwater extraction but would take longer to reduce toxicity and volume.

5. Short-Term Effectiveness

Short-term effectiveness addresses potential human health and environmental risks associated with the alternative during the construction and implementation phase.

Alternative 1 (no action) would involve no activities and therefore present no construction-related short-term exposure risks to human health or the environment. All other active remedies could present minimal short-term exposure risks to workers, adjacent populations, or the environment that would be managed through monitoring and engineering controls. Additionally, the treatment technologies included within Alternatives 2, 3, and 4 have previously been installed, without harm to human health and the environment, within OU-1 and OU-2.

6. Implementability

The analysis of implementability considers the technical and administrative feasibility of remedy implementation, as well as the availability of required materials and services.

The No Action alternative can be easily implemented because there are no technical or administrative components requiring action. Alternatives 2, 3, and 4 are all technically and administratively feasible. ERD and pump and treat systems have been used for clean-up and control of contamination at the Site already. Alternatives 5 and 6 are technically and administratively feasible but the installation of a thermal treatment system, though effective at other sites, has not been utilized at this site. Required materials and services for Alternatives 2 through 6 are readily available.

7. Cost

The cost analysis evaluated capital costs and annual operation and maintenance (O&M) costs. The total present value cost is the sum of initial capital costs and the discounted value of O&M costs over the lifespan of the remedy.

Total Present Value Cost:
Alternative 1 $0
Alternative 2 $5,009,611
Alternative 3 $2,777,047
Alternative 4 $4,640,170
Alternative 5 $13,197,583
Alternative 6 $13,841,112

8. Community Acceptance

Community acceptance of the preferred remedy will be evaluated after the public comment period. Public comments will be summarized and responses provided in the Responsiveness Summary Section of the Record of Decision document that will present the Department's final alternative selection. The Department may choose to modify the preferred alternative or select another remedy based on public comments or new information.

SUMMARY OF THE DEPARTMENT'S PREFERRED ALTERNATIVE

The Department's preferred remedial alternative to address contamination at the Site is Alternative 2. This alternative would consist of excavation and off-site disposal of source area vadose zone soils and in-situ enhanced reductive dechlorination (ERD) via anaerobic bioremediation to remediate the COCs in the groundwater source area and downgradient dissolved phase areas. Both ERD and excavation have previously been used effectively at this site to reduce soil and groundwater contamination.

The ERD remedy will consist of injection wells installed in transects across the source area saturated zone and the downgradient dissolved phase area into which an electron donor (such as molasses or emulsified vegetable oil) will be injected to create an anaerobic reactive zone. Monitored natural attenuation (MNA) will be implemented following completion of the active phase of the ERD to monitor the decline of low-level concentrations of COCs. Deed notifications/restrictive covenants would further reduce the potential for receptor exposure to residual COCs in soil and groundwater.

The net present value of this alternative is estimated at $5,009,611

Based on information currently available, the Department believes the Preferred Alternative would be protective of human health and the environment, would comply with ARARs, would be cost-effective, and would utilize permanent solutions to the maximum extent practicable. This remedy also meets the statutory preference for the selection of a remedy that involves treatment as a principle element.

USE THIS SPACE TO WRITE YOUR COMMENTS

Your input on the Proposed Plan for the AVX-Myrtle Beach/Operable Unit 1 Site is important. Comments provided by the public are valuable in helping DHEC select a final cleanup remedy.

You may use the space below to write your comments, then fold and mail. Comments must be postmarked by May 15, 2021. If you have any questions, please contact Carol Crooks at 803-898-0810. You may also submit your questions and/or comments electronically to: crookscl@dhec.sc.gov

Name _____ Telephone _____

Address _____ Email _____

City _____

State _____Zip _____